	REVISIONS		
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
Α	Change to Standard Military Drawing (SMD) format. Add vendor CAGE 23223. Change ØD dimension. Add ac test circuit and waveforms.	88-03-29	M. A. Frye
В	Add vendor CAGE 27014. Correct figure 3 waveforms. Changed to reflect MIL-H-38534 processing. Editorial changes throughout.	90-09-21	W. Heckman
С	Correct figure 3, input slew rate waveform. Update document. Editorial changes throughout.	92-08-12	D. R. Cool
D	Changes in accordance with NOR 5962-R228-93.	93-09-03	K. A. Cottongim
Е	Add vendor CAGE 51651. Make changes to table I. Rewrite entire document.	94-05-03	K. A. Cottongim
F	Remove CAGE codes 23223 and 64762. Changes to table I.	98-07-01	K. A. Cottongim
G	Corrections to sheet 1. Update drawing boilerplate.	04-03-10	Raymond Monnin

# THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

# CURRENT CAGE CODE 67268

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STANDARD MICROCIRCUIT DRAWING		KED BY ım E. Sho	up			POST OFFICE BOX 3990 COLUMBUS, OHIO 43216-5000 http://www.dscc.dla.mil										
THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS		OVED BY Hauck	′			MICROCIRCUIT, HYBRID, LINEAR, 0.2-AMP, POWER, OPERATIONAL AMPLIFIER, THICK FILM					•					
AND AGENCIES OF THE DEPARTMENT OF DEFENS	I DNAW	DRAWING APPROVAL DATE 79-01-17														
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# 1. SCOPE

- 1.1 <u>Scope</u>. This drawing describes device requirements for class H hybrid microcircuits to be processed in accordance with MIL-PRF-38534 and a choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN).
- 1.2 PIN. The PIN shall be as shown in the following example:



1.2.1 <u>Device type(s)</u>. The device type(s) shall identify the circuit function as follows:

Device type	Generic number	<u>Circuit function</u>
01	0041, MSK 0041	Current amplifier

1.2.2 <u>Case outline(s)</u>. The case outline(s) shall be as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	<u>Terminals</u>	Package style
Z	See figure 1	12	Can

1.2.3 <u>Lead finish</u>. The lead finish shall be as specified in MIL-PRF-38534.

1.3 Absolute maximum ratings.

Supply voltage range (±V <sub>S</sub> )	±18 V dc
Input voltage range	±15 V dc <u>1</u> /
Power dissipation (P <sub>D</sub> )	1.5 W <u>2</u> /
Differential input voltage	±30 V dc
Peak output current	0.5 A <u>3</u> /
Output short circuit duration	Continuous 4/
Storage temperature range	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+300°C
Thermal resistance:	
Junction-to-case (θJ <sub>C</sub> )	70°C/W
Junction-to-ambient (θJ <sub>A</sub> )	100°C/W
Junction temperature (T <sub>J</sub> )	+150°C

1.4 Recommended operating conditions.

Ambient operating temperature range (T<sub>A</sub>).....-55°C to +125°C

 $\overline{3}$ / Rating applies for R<sub>SC</sub> = 0 ohms.

A/ Rating appiles as long as package power rating is not exceeded.

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 $<sup>\</sup>underline{1}/$  Rating applies for supply voltages above  $\pm 15$  V. For supplies less than  $\pm 15$  V, rating is equal to the supply voltage.

<sup>2</sup>/ Rating applies at  $T_A = +25$ °C, without heat sink.

### 2. APPLICABLE DOCUMENTS

2.1 <u>Government specification, standards, and handbooks</u>. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

### DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.

#### DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits.

MIL-STD-1835 - Interface Standard Electronic Component Case Outlines.

#### DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 - List of Standard Microcircuit Drawings (SMD's).

MIL-HDBK-780 - Standard Microcircuit Drawings.

Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or www.dodssp.daps.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 <u>Order of precedence</u>. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

#### 3. REQUIREMENTS

- 3.1 <u>Item requirements</u>. The individual item performance requirements for device class H shall be in accordance with MIL-PRF-38534. Compliance with MIL-PRF-38534 shall include the performance of all tests herein or as designated in the device manufacturer's Quality Management (QM) plan or as designated for the applicable device class. The manufacturer may eliminate, modify or optimize the tests and inspections herein, however the performance requirements as defined in MIL-PRF-38534 shall be met for the applicable device class. In addition, the modification in the QM plan shall not affect the form, fit, or function of the device for the applicable device class.
- 3.2 <u>Design, construction, and physical dimensions</u>. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.
  - 3.2.1 Case outline(s). The case outline(s) shall be in accordance with 1.2.2 herein and figure 1.
  - 3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.
  - 3.2.3 Test circuit and waveforms. The test circuit and waveforms shall be as specified on figure 3.
- 3.3 <u>Electrical performance characteristics</u>. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.
- 3.4 <u>Electrical test requirements</u>. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are defined in table I.
- 3.5 <u>Marking of device(s)</u>. Marking of device(s) shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked.

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- 3.6 <u>Data</u>. In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DSCC-VA) upon request.
- 3.7 <u>Certificate of compliance</u>. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DSCC-VA shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.
- 3.8 <u>Certificate of conformance</u>. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

#### 4. VERIFICATION

- 4.1 <u>Sampling and inspection</u>. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.
  - 4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:
    - a. Pre-seal burn-in test, method 1030 of MIL-STD-883. (optional for class H)
      - (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1030 of MIL-STD-883.
      - (2) T<sub>A</sub> as specified in accordance with table I of method 1015 of MIL-STD-883.
    - b. Burn-in test, method 1015 of MIL-STD-883.
      - (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.
      - (2) T<sub>A</sub> as specified in accordance with table I of method 1015 of MIL-STD-883.
    - c. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

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	TABLE I. <u>Electrical performance characteristics</u> .							
Test	Symbol	Conditions $\underline{1}/$ -55°C $\leq$ T <sub>A</sub> $\leq$ +125°C	Group A subgroups	Device type	Lin	nits	Unit	
		unless otherwise specified	- Subgroups	casgroups type		Max	<u> </u>	
Input offset voltage	V <sub>IO</sub>	$R_S = 100\Omega \ \underline{2}/$	1	01		3	mV	
			2,3			5		
Input offset current	I <sub>IO</sub>	2/	1	01		100	nA	
			2,3			300		
Input bias current	I <sub>IB</sub>	<u>2</u> /	1	01		300	nA	
			2,3			1	μΑ	
Input resistance 3/	R <sub>IN</sub>	T <sub>A</sub> = +25°C	4	01	0.3		MΩ	
Common mode rejection	CMRR	$R_S = 100\Omega, V_{CM} = \pm 10 \text{ V}$	1,2,3	01	70		dB	
ratio		$R_S = 100\Omega$ , $V_{CM} = \pm 10$ V, $f_{IN} = 10$ Hz (for vendor CAGE code 51651 only)	4,5,6 <u>4</u> /		70			
Input voltage range 3/	V <sub>CM</sub>		1,2,3	01	±12		V	
Power supply rejection ratio	PSRR	$R_S \le 100\Omega,$ $V_S = \pm 5 \text{ V to } \pm 15 \text{ V}$	1,2,3	01	80		dB	
Voltage gain <u>5</u> /	A <sub>V</sub>	$V_O = \pm 10 \text{ V}, \text{ R}_L = 1 \text{ k}\Omega,$ $T_A = +25^{\circ}\text{C}$	1	01	100		V/mV	
		$V_{O} = \pm 10 \text{ V}, R_{L} = 100\Omega$	1,2,3	01	25			
		$V_O=\pm 10~V,~R_L=1~k\Omega,\\ f_{1N}=10~Hz,~T_A=+25^{\circ}C\\ (for~vendor~CAGE~code\\ 51651~only)$	4	01	100			
		$V_O = \pm 10$ V, $R_L = 100\Omega$ , $f_{\text{IN}} = 10$ Hz, (for vendor CAGE code 51651 only)	4,5,6 <u>4</u> /	01	25			
Output voltage swing	Vo	$R_L = 100\Omega$	1,2,3	01	±13		V	
Output short circuit current	I <sub>SC</sub>	$R_{SC} = 3.3\Omega, T_A = +25^{\circ}C$	1	01	-300	+300	mA	

See footnotes at end of table.

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TABLE I. <u>Electrical performance characteristics</u> - Continued.							
Test	Symbol	$-55^{\circ}\text{C} \le \text{T}_{\text{A}} \le +125^{\circ}\text{C}$ subgroups		Device type		nits	Unit
		unless otherwise specified		<del> </del>	Min	Max	
Supply current	Icc	V <sub>OUT</sub> = 0 V	1,2,3	01		3.5	mA
Power consumption 3/	Pc	V <sub>OUT</sub> = 0 V	1,2,3	01		105	mW
Slew rate	SR	$A_V = 1, R_L = 100\Omega$	4	01	1.5		V/μs
Small signal rise time	t <sub>r</sub>	$T_A = +25$ °C, see figure 3	9	01		1	μs
Small signal fall time	t <sub>f</sub>	$T_A = +25$ °C, see figure 3	9	01		1	μs
	1			1	'	,	

01

20

%

- Unless otherwise specified,  $\pm V_S=\pm 15$  V,  $C_C=3000$  pF. Specifications apply for  $\pm 5$  V  $\leq \pm V_S \leq \pm 18$  V.

Small signal overshoot

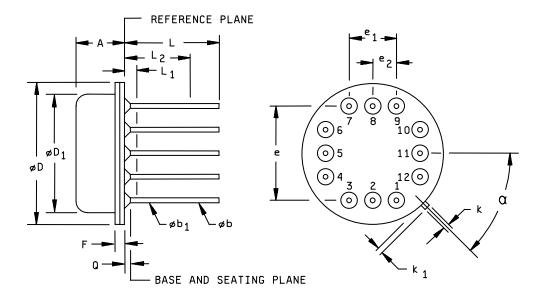
Parameter shall be guaranteed to the limits specified in table I for all lots not specifically tested.

 $T_A = +25^{\circ}C$ , see figure 3

- Subgroups 5 and 6 shall be tested as part of device initial device characterization and after design and process changes. Parameter shall be guaranteed to the limits specified for subgroups 5 and 6 for all lots not specifically
- The amplifier has a "dead band" when V<sub>OUT</sub> is near zero volts. Typical values for the "dead band" are in the 50 to 200  $\mu$ V range. Open-loop gain is measured at V<sub>OUT</sub> from  $\pm 0.5$  V dc to  $\pm 10$  V dc which is out of the range of the "dead band".

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# Case outline Z.



					Dimens	sions					
Symbol	Inches		Millimeters		Notes Symbol	Inches		Millimeters		Notes	
-	Min	Max	Min	Max	1		Min	Max	Min	Max	
Α	0.130	0.181	3.30	4.60		F	0.022	0.030	0.56	0.76	
Øb	0.016	0.019	0.41	0.48	1, 5	k	0.026	0.036	0.66	0.91	
Øb₁	0.016	0.021	0.41	0.53	1, 5	k <sub>1</sub>	0.026	0.036	0.66	0.91	2
ØD	0.595	0.610	15.11	15.37		L	0.500	0.560	12.70	14.22	1
$\emptyset D_1$	0.545	0.555	13.84	14.10		L <sub>1</sub>		0.050		1.27	1
е	0.400	BSC	10.16	BSC	3	L <sub>2</sub>	0.250		6.35		1
e <sub>1</sub>	0.200	) BSC	5.08	BSC	3	Q		0.045		1.14	1
<b>e</b> <sub>2</sub>	0.100	) BSC	2.54	BSC	3	α	45° I	BSC	45°	BSC	3

# NOTES:

- 1. (All leads)  $\varnothing$ b applies between  $L_1$  and  $L_2$ .  $\varnothing$ b<sub>1</sub> applies between  $L_2$  and 0.500 (12.70 mm) from the reference plane. Diameter is uncontrolled in L<sub>1</sub> and beyond 0.500 (12.70 mm) from the reference plane.
- Measured from the maximum diameter of the product.
   Leads having a maximum diameter of 0.019 (0.48 mm) measured in gauging plane 0.054 (1.37 mm) +0.001 (0.03 mm), -0.000 (0.00 mm) below the base plane of the product shall be within 0.007 (0.18 mm) of their true position relative to a maximum width tab.
- 5. The product may be measured by direct methods or by gauge.
- 6. All leads: Increase maximum limit by 0.003 (0.08 mm) when lead finish A or B is applied.

FIGURE 1. Case outline(s).

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Device type	01
Case outline	Z
Terminal symbol	Terminal number
1	I <sub>SC</sub> +
2 3	Compensation Ground
4 5	No connect -V <sub>IN</sub>
6 7	+V <sub>IN</sub> Offset null
8 9	Offset null I <sub>sc</sub> -
10 11	-V <sub>S</sub> Output
12	+V <sub>S</sub>

- NOTES:

  1. C<sub>C</sub> is connected between pins 2 and 11.
  2. Case is electrically isolated.

FIGURE 2. Terminal connections.

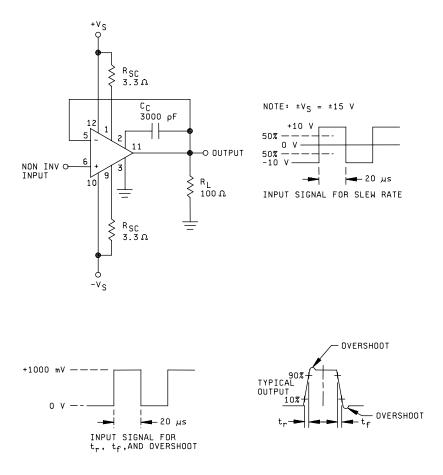


FIGURE 3. Test circuit and waveforms.

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TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	
Final electrical parameters	1*, 2, 3, 4, 5, 6, 9
Group A test requirements	1, 2, 3, 4, 9
Group C end-point electrical parameters	1, 2, 3

<sup>\*</sup> PDA applies to subgroup 1.

- 4.3 <u>Conformance and periodic inspections</u>. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.
  - 4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:
    - a. Tests shall be as specified in table II herein.
    - b. Subgroups 7, 8, 10, and 11 shall be omitted.
  - 4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534.
  - 4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:
    - a. End-point electrical parameters shall be as specified in table II herein.
    - b. Steady-state life test, method 1005 of MIL-STD-883.
      - (1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DSCC-VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.
      - (2) T<sub>A</sub> as specified in accordance with table I of method 1005 of MIL-STD-883.
      - (3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.
  - 4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534.
  - 5. PACKAGING
  - 5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

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# 6. NOTES

- 6.1 <u>Intended use</u>. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.
- 6.2 <u>Replaceability</u>. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.
- 6.3 <u>Configuration control of SMD's</u>. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-PRF-38534.
- 6.4 <u>Record of users</u>. Military and industrial users shall inform Defense Supply Center Columbus (DSCC) when a system application requires configuration control and the applicable SMD. DSCC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DSCC-VA, telephone (614) 692-0544.
- 6.5 <u>Comments</u>. Comments on this drawing should be directed to DSCC-VA, Post Office Box 3990, Columbus, Ohio 43216-5000, or telephone (614) 692-1081.
- 6.6 <u>Sources of supply</u>. Sources of supply are listed in MIL-HDBK-103 and QML-38534. The vendors listed in MIL-HDBK-103 and QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DSCC-VA and have agreed to this drawing.

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### STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 04-03-10

Approved sources of supply for SMD 85087 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38534 during the next revisions. MIL-HDBK-103 and QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DSCC-VA. This information bulletin is superseded by the next dated revisions of MIL-HDBK-103 and QML-38534.

Standard	Vendor	Vendor
microcircuit drawing	CAGE	similar
PIN <u>1</u> /	number	PIN <u>2</u> /
8508701ZA	27851	FLH0041G/883
8508701ZA	51651	MSK 0041B
8508701ZC	51651	MSK 0041B

- 1/ The lead finish shown for each PIN, representing a hermetic package, is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the Vendor to determine availability.
- <u>2</u>/ <u>Caution</u>. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name <u>and address</u>
27851	Satcon Electronics 165 Cedar Hill Street Marlborough, MA 01752
51651	M. S. Kennedy Corporation 4707 Dey Road Liverpool, NY 13088

The information contained herein is disseminated for convenience only and the Government assumes no liability whatsoever for any inaccuracies in the information bulletin.